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0010641198 - Drawing available

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Semiconductor device used for memory, e.g., dynamic random access memory, has thin capacitor film consisting of lead zirconate titanate doped with niobium formed on lower electrode

Patent Assignee: HYNIX SEMICONDUCTOR INC (HYNI-N); HYUNDAI ELECTRONICS IND CO LTD (HYUN-N)

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Patent Family (4 patents, 3 countries)

| Patent | | | Application | | | |
|---------------|------|----------|---------------|------|----------|----------|
| Number | Kind | Date | Number | Kind | Date | Update |
| JP 2001036030 | A | 20010209 | JP 2000195213 | A | 20000628 | 200126 B |
| KR 2001004363 | A | 20010115 | KR 199924993 | A | 19990628 | 200151 E |
| KR 333669 | B | 20020424 | KR 199924993 | A | 19990628 | 200270 E |
| US 6465260 | B1 | 20021015 | US 2000605633 | A | 20000628 | 200271 E |

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Patent Details

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| JP 2001036030 | A | JA | 7 | 7 | |
| KR 2001004363 | A | KO | | 1 | |
| KR 333669 | B | KO | | | Previously issued patent KR 2001004363 |

Alerting Abstract JP A

NOVELTY - Active substrate has a silicon oxide layer formed on isolation area which isolates the transistor formed on silicon substrate and the substrate. A ferroelectric capacitor structure consisting of thin capacitor film (22A) and upper electrode sequentially formed on lower electrode is formed on the silicon oxide layer. The film consists of lead zirconate titanate (PZT) doped with niobium.

DESCRIPTION - An INDEPENDENT CLAIM is also included for semiconductor device manufacturing method.

USE - For memory, e.g., dynamic random access memory (DRAM).

ADVANTAGE - Since niobium dopant is added to PZT in capacitor thin film, leakage current is reduced.

DESCRIPTION OF DRAWINGS - The figure shows the sectional view of the semiconductor memory device.

22A Thin capacitor film

Title Terms /Index Terms/Additional Words: SEMICONDUCTOR; DEVICE; MEMORY; DYNAMIC; RANDOM; ACCESS; THIN; CAPACITOR; FILM; CONSIST; LEAD; ZIRCONATE; TITANATE; DOPE; NIOBIUM; FORMING; LOWER; ELECTRODE

Class Codes

International Classification (Main): H01L-021/00, H01L-027/10, H01L-027/105
US Classification, Issued: 438003000, 438240000, 438393000

File Segment: CPI; EPI

DWPI Class: L03; U11; U12; U13; U14

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Original Publication Data by Authority**Japan**

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SEMICONDUCTOR DEVICE AND ITS MANUFACTURE
Assignee: HYUNDAI ELECTRONICS IND CO LTD (HYUN-N)
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Language: JA (7 pages, 7 drawings)
Application: JP 2000195213 A 20000628 (Local application)
Priority: KR 199924993 A 19990628
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Korea

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Publication Date: 20010115
Assignee: HYNIX SEMICONDUCTOR INC (HYNI-N)
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Assignee: HYNIX SEMICONDUCTOR INC (HYNI-N)
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United States

Publication No. US 6465260 B1 (Update 200271 E)
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Semiconductor device having a ferroelectric capacitor and method for the manufacture thereof
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Language: EN
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Original US Class (main): 4383
Original US Class (secondary): 438240 438393
Original Abstract: A semiconductor device for use in a memory cell includes an active matrix provided with a semiconductor substrate, a transistor formed on the semiconductor substrate, an isolation region for isolating the transistor and an insulating layer formed on top of the transistor and the isolation region; and a capacitor structure, formed on top of the insulating layer, composed of a bottom electrode,

a capacitor thin film placed on top of the bottom electrode and a top electrode formed on top of the capacitor thin film, wherein the capacitor thin film is made of Nb doped lead zirconate titanate (PNZT). In the device, the PNZT is formed by using a sol-gel coating solution is represented by a formula $Pb(1-x/2)Pbx(Zr_{0.52}Ti_{0.48})(1-x)O_3$, where x is equal to $0(\text{tilde})0.05$ assuming that Nb compensates charges generated by Pb vacancies. The semiconductor device can lower leakage current approximately 2 order by adding Nb dopants to the PZT. Further, the present invention is capable of forming the capacitance thin film on the bottom electrode at a low temperature by spin coating the PNZT coating solution in the form of sol-gel.

Claim: What is claimed is:

1.10. A method for forming a sol-gel coating solution to make a ferroelectric material, the method comprising steps of:

- * a) preparing precursors P1, P2, P3 and P4;
- * b) dehydrating the P1 in vacuum and dissolving the vacuum dehydrated P1 in 2-methoxyethanol;
- * c) mixing the dissolved P1 and the P2, thereby obtaining a Pb--Nb solution;
- * d) mixing the P3 and the P4 under inert gas atmosphere, thereby obtaining a Zr--Pb solution;
- * e) refluxing the Pb--Nb solution and the Zr--Pb solution;
- * f) adding NH_4OH for base-catalyzed condition; and
- * g) adding ethylene glycol as a kind of dry control chemical additive, thereby obtaining the sol-gel coating solution.

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